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ABSTRACT

This paper reports on a study of the relationship between internal and external organizational variables and the adoption of a specific educational innovation--individually guided education and the multiunit school (IGE/MUS). The emphasis of the paper is on the independent variables of structure (internal organization) and linkage (external organization) and their relationship to the dependent variable of diffusion. An eclectic theoretical approach, using major change models and social systems theory, guided the construction of a series of questions focusing on internal and external organizational factors related to diffusion. Using these questions, 33 respondents involved in IGE/MUS projects in three different States were interviewed. Analysis of the findings suggests that intraorganizational structure and interorganizational linkage are interrelated and may be useful in explaining some of the variance in the adoption of educational innovations by different organizations. (Author/JG)

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THE CONCEPT OF STRUCTURE FOR DESCRIBING THE DIFFUSION OF AN INNOVATION THROUGH INTERORGANIZATIONAL LINKAGES

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There have been a flood of models, typologies, schemes, and prescriptions for illuminating the murky path toward effective utilization of knowledge and developments of research. Confusion (Sieber, 1974: 62-63), poor quality (Giacquinta, 1973: 178), and biases (Baldridge, 1974: 5-15) within the knowledge utilization and change literature have been claimed and documented. The following description of the diffusion of an innovation is directed toward exploring the utility of one variable, structure, for differentiating and possibly contributing to understanding the efficiency of one knowledge utilization process--linkage (inter-system connectedness). By explicitly recognizing the confused, inadequate, and at times inappropriate nature of the knowledge utilization literature, it is possible to resist temptations for programatic remedies and focus instead on trying to understand the complex relationships involved with the diffusion and utilization of complex products of research.

Conceptual Framework

During the spring of 1973 an exploratory case study was conducted in order to explicate the relationships among three dinstinct systems (resource, mediating, and user) involved with the diffusion of an innovation--Individually Guided Education and the Multiunit School--IGE/MUS (Paul, 1974). The establishment of the organizational and administrative components of the multiunit school (dependent variable) and linkage, structure, and capability (independent variables) made up the framework underlying the study. Structure and capability may be thought of as internal organizational variables and linkage may be thought of as an external organizational variable. The focus of the study was to explore the relationship between internal and external organizational variables and the adoption of Individually Guided Education and the Multiunit School. The external organizational

variable of linkage represented a knowledge utilization process, a means for translating a development of research from its source to its users. The emphasis of this paper, however, is on the independent variables of structure and linkage and their relationship to the dependent variable of diffusion, i.e., What is the relationship between the internal organizational characteristic of structure and the external organizational process of linkage vis-a-vis the adoption of IGE/MUS?

A discussion of the utility of structure as an explanatory variable is presented in terms of its theoretical and conceptual basis and its operationalization. Theoretically, structure is incorporated within the social system model developed by Getzels and Guba (1957) and applied to educational administration by Getzels, Lipham, and Campbell (1968). From a social system perspective, structure is viewed as an organizational and administrative property of roles and role expectations. If the role of an organization is explicitly defined and the expectations of incumbents are systematically coordinated, then structure can be inferred.

Structural properties of organizations have been identified and studied, e.g., Pugh, Hickson, et. al. (1963), and Aiken and Hage (1968). A delineation and analysis of major structural components of organizations has been presented by Hall (1973: 72), e.g., specialization, standardization, formalization, centralization, complexity, configuration, and flexibility. Relationships between structural variables and organizational ends have been proposed (Hage, 1965).

The concept of structure has been incorporated into knowledge utilization schemes. For example Guba's (1966) research, development, diffusion, adoption model addresses, in part, the loosely organized and coordinated status of educational research. The lack of mechanisms for

achieving a coordinated approach for linking the worlds of the researcher and the practitioner has been stressed by Guba (1967). Structure is included within the seven dissemination and utilization factors identified by Havelock (1971). Borrowing from Havelock's description of structure as "a rational sequence of steps, compartmentalization and coordination, division of labor (ch. 11, p.23)," and borrowing from social system theory, an eclectic definition of structure was developed.

Coordination, hierarchical communication, specialization and role clarity made up the definition of structure. Describing the organizational systems involved in the diffusion of an innovation in terms of structure was found to be heuristicly useful. Coordination was measured according to cooperation among work units, interdependent roles, and the degree to which diffusion personnel tended to work closely together. Hierarchical communication was measured according to the extent to which role incumbents interacted with superordinates--vertical communication. Specialization was measured according to the degree of division of labor and the grouping of homogeneous tasks. Role clarity was measured according to the extent to which role expectations were perceived as explicit and precise or implicit and vague.

The concept of linkage was adapted from Havelock's (1971) typology and categorized according to three distinct dimensions: type of linkage, mode of linkage, and frequency of linkage. Type of linkage was measured according to three activities: consulting, training, and conveying. Consulting represented a collaborative problem solving activity; training referred to inservice and preservice teaching activities; and conveying corresponded to dissemination of information in contradistinction to problem solving and teaching activities. Mode of linkage was measured

according to three possible means for carrying out linkage activities: face-to-face, telephone, or print material. A face-to-face mode of linkage was considered two-way communication embodying opportunities for feedback, revision of messages, and assessment of audience. A telephone mode of linkage was also considered two-way communication but less potent than a face-to-face mode-- assessment, feedback, and revision were assumed to be limited. The third mode of linkage, print material, was considered one-way communication with minimal opportunities for senders to receive feedback and virtually no opportunities for messages to be revised or reaction from the audience to be assessed. The frequency of linkage was measured according to estimates of the number of face-to-face, telephone, or print material contacts between systems on an annual basis. Linkage represents interorganizational relationships, the process by which a development of research travels from the resource system to the user system, and in the instance of IGE/MUS, through an intermediary--the mediating system.

The dependent variable of diffusion was measured according to the degree of adoption of the innovation. Usually diffusion is defined as the dissemination of an innovation, but in this study, the hoped for result of dissemination, i.e., adoption, was the definition of diffusion. The degree of adoption introduces the issue of adaptation. If an innovation is adapted by the user system to such an extent that it is no longer recognizable, then adoption has not taken place. Ironside's (1972) national survey of IGE/MUS implementation referred to this issue--wide variations in implementation militated against an accurate determination of the number of adopters (p.14). Degree of adoption in this study was measured according to the establishment of three major organizational

components of the multiunit school configuration. Respondents described the three components for each school and their replies were coded as positive, negative, or lack of information.

Does the concept of structure have utility for describing inter-system relationships (linkage) vis-a-vis the diffusion of an innovation? This question was investigated in terms of the interorganizational relationships operating between resource, mediating, and user systems on one hand, and the adoption of the innovation IGE/MUS on the other. The resource system was a national R & D Center and developer of the innovation IGE/MUS; the mediating system included state education agencies (SEAs) and teacher education institutions (TEIs) involved in the diffusion of IGE/MUS; and the user system included local education agencies (LEAs) adopting IGE/MUS.

Methodology

Three states, two in the Midwest and one in the East Coast, were identified as fulfilling the following criteria: (1) they had entered into an implementation contract with the R & D Center, (2) they had appointed at least one state coordinator for IGE/MUS implementation, (3) they had established in at least one teacher education institution a program for training and/or assisting in IGE/MUS implementation, and (4) they had established a core of operating multiunit schools.

Respondents from the resource system included members of the implementation unit and the former director of the R & D Center (N=6); respondents from the mediating system included three state coordinators for IGE/MUS and seven professors involved with IGE/MUS activities (N=10); respondents from the user system included principals, unit leaders, and unit teachers (N=18). The selection of multiunit schools in each state did not follow a random sampling design. Rather, TEI

personnel nominated multiunit schools based on the following criteria: (1) they had implemented the MUS configuration, (2) they had considerable contact with the TEI, and (3) they were representative of multiunit schools in the state. The rationale for such a sampling procedure emanated from the need for assuring opportunities for exploring relationships among the three systems. Because of the different scope of activities of the resource and mediating systems, some initial screening was necessary. The national scope of the R & D Center affected all multiunit schools, the statewide scope of the state education agency affected multiunit schools in the state, whereas the regional scope of the TEI, affected multiunit schools only in their vicinity. Consequently, MUS nominations were solicited from the organization with the most geographically limited scope, the teacher education institution. Although a definite bias was introduced by using this procedure, and representativeness could not be considered present, the objective of assuring possibilities for exploring relationships among all systems was achieved.

A semi-structured interview schedule was constructed and administered to the 33 respondents. Four items were used to measure structure:

(1) How closely do work with (insert name of work unit)?

(2) Do you directly communicate with (insert name of superordinate)?

(3) Are the activities of your unit divided up among the staff?

(4) Would you describe your job as structured or unstructured?

Three items were used to measure linkage:

(1) Please describe the activities you do with (insert name of organization).

(2) How do you carry out these activities?

(3) How frequently do you carry out these activities?

Three items were used to measure diffusion. For each organizational component investigated, the definition of the component was repeated to the respondent in order to emphasize adoption as opposed to adaptation.

(1) Do you consider that (insert name of school) has established Instructional and Research Units?

(2) Do you consider that (insert name of school) has established an Instructional Improvement Committee?

(3) Do you consider that (insert name of district) has established a System Wide Policy Committee?

The schedule was pilot tested for length, ease of administration, phrasing, and order of questions. Content validity was judged sufficient by a panel of organizational theory experts, and interrater reliability was determined by indexing the percentage of agreement between three independent raters and the researcher's codification of four response sets. Agreement between the researcher and the three raters occurred for 95 per cent of the selected responses. The interview sessions lasted, on the average, 90 minutes; verbatim notes and summaries were written during the session and, for salient issues, read out loud to the interviewee to minimize distortion and bias.

Findings

The responses to the structure items differentiated between the systems (see appendix A). Percentage responses to the structure items were grouped according to high, moderate, or low perceived structure. In describing order, the TEI, user system, resource system, and SEA reported high structure.

The TEI respondents reported high internal coordination, hierarchical communication, and specialization. Role clarity, however, was considered low. The professors involved with IGE/MUS activities tended to work as a team and each tended to have a particular area of specialization corresponding to their academic interests.

The user system had the next highest structure. Since IGE/MUS prescribed organizational and administrative structures, user system responses were entwined with the adoption of the innovation. The user system had two roles, the establishment of the multiunit school design and the utilization of external assistance. User system structure involved the first role, although other responses shed some light on the second role. For example, in a number of schools, mechanisms for facilitating external assistance were totally lacking, and visits by personnel from other systems (linkage agents) were either unannounced, unscheduled or considered a nuisance. Explicit expectations for training in order to learn new roles and develop attitudes supportive of IGE/MUS were the exception rather than the rule.

The resource system reported high specialization and hierarchical communication, moderate internal coordination, and low role clarity. Among the members of the implementation unit, a division of labor was clearly evident. Some members conducted workshop activities, others worked with the mediating system, and others were involved with planning present and future implementation programs. Vertical communication was fairly extensive, thereby providing top decision makers with first hand information on diffusion activities. Frequent vertical communication was also considered an indication of the importance attached to diffusion. Internal coordination was considered

low by some respondents and high by others. High specialization was considered as one source of the low internal coordination, i.e., distinctive roles tended to segregate members and act as a limiting factor for coordination. The low role clarity was influenced by the university and research norms of the resource system, viz., self-defined expectations.

The SEA reported the lowest structure: internal coordination and specialization were low, and hierarchical communication and role clarity were moderate. The SEA respondents were usually the only members of the organization explicitly involved with diffusion of the innovation. Although other SEA program units were involved in activities relevant to the diffusion of IGE/MUS, they tended to have minimal to no involvement. Turnbull, Thorn, and Hutchins (1974: 13) offer a possible explanation for this: state departments usually set priorities several years in advance which may limit the fit between activities necessary for the diffusion of the innovation on the one hand, and those prescribed for the SEA on the other. Since IGE/MUS diffusion activities lacked an agency-wide programatic thrust, and were staffed by one person who was also usually responsible for additional programs, internal coordination suffered. Multiple program responsibilities was also the major reason for low SEA specialization. IGE/MUS state coordinators tended to have two or more program responsibilities, of which IGE/MUS diffusion was only one. Hierarchical communication and role clarity were moderate. Vertical communication with the chief state school officer tended to be limited to either annual meetings, reports funneled through established channels or informal means. Due in part to the multiple roles performed and the lack of established guidelines for linkage agents, SEA respondents

perceived their role as somewhat ambigious.

There were five response combinations for the linkage variable depending on the focal system and the affiliation of respondents (see appendix B). For example: linkage with resource system reported by mediating and user system; linkage with mediating and user systems reported by resource system; linkage with user system reported by mediating system; linkage with mediating system reported by user system; and linkage within the mediating system reported by SEA and TEI. Summaries of the combinations revealed that (1) the TEI had the most frequent training and consulting activities on a face-to-face basis with the user system, (2) the SEA had the second highest frequency of linkage with the user system, however it was primarily one-way communication dealing with conveying information, (3) the resource system had the third highest frequency of linkage with the user system and it was primarily one-way conveying of information with some consulting and training activities, (4) the resource and mediating systems had frequent two-way communication focusing on consulting activities, and (5) the SEA and TEI had frequent two-way communication revolving around consulting activities. Figure 1 depicts the linkage relationships between the systems. The density of the arrows indicates frequency, and the direction of the arrows refers to either one-way or two-way communication.

(Figure 1 here)

Responses to the three diffusion items revealed a direct relationship between the scope of the responding system and knowledge of the establishment of the innovation (see appendix C). The resource system had the broadest scope and the least information concerning the user system, whereas the TEI had the narrowest scope and the most information concerning the user system. The majority of respondents indicated that

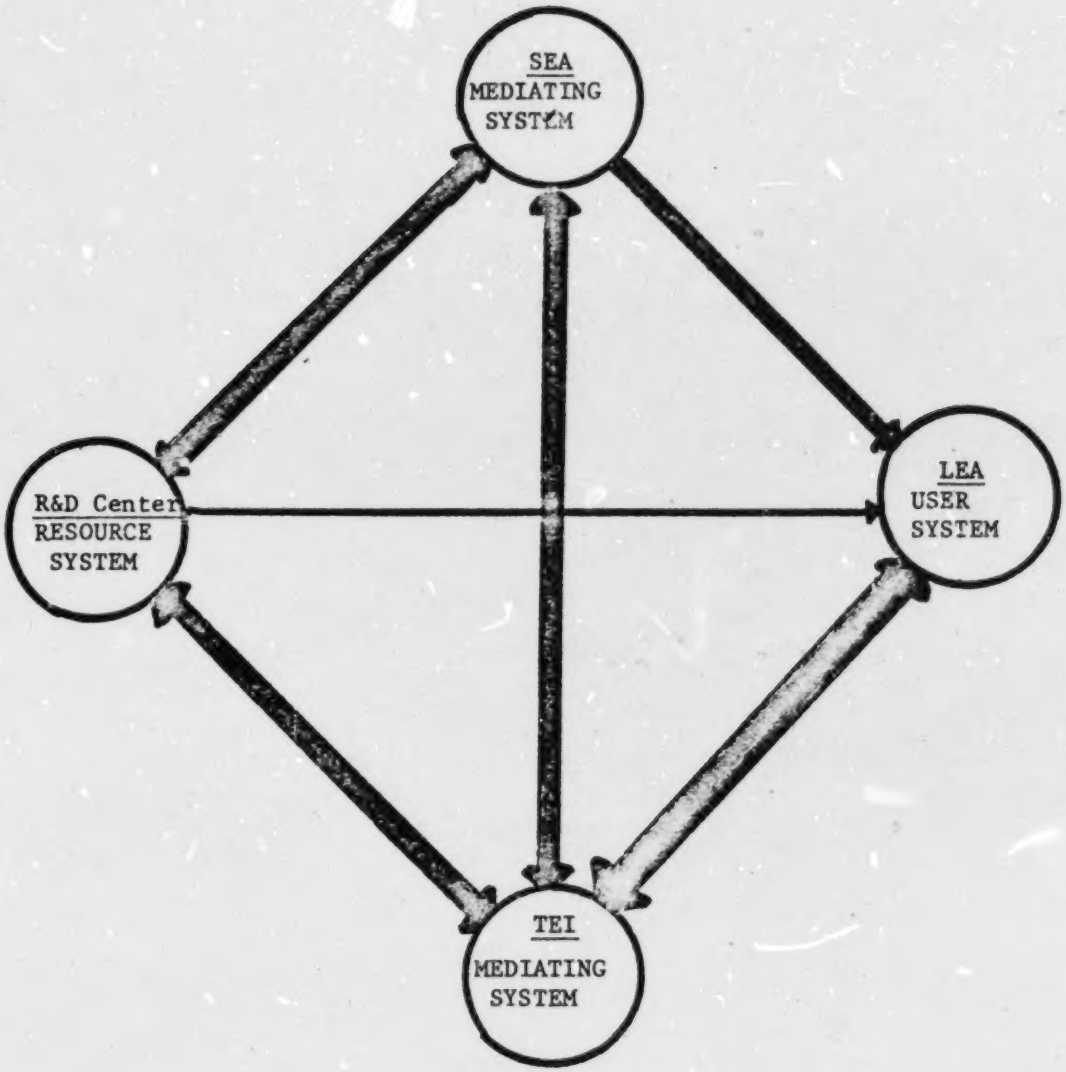

Fig. 1 -- The Linkage Relationships Among Resource, Mediating, and User Systems

implementation of the multiunit organizational design had taken place.

To return to the initial question underlying the study--the relationship between structure, linkage, and diffusion--it is first necessary to comment on the descriptive utility of the structure, linakge, and diffusion items. The structure items iilicited extensive and detailed descriptions of internal organizational characteristics and the linkage items exposed qualitative and quantitative aspects of inter-system relationships. The diffusion items had less descriptive utility. For the user system diffusion was entwined structure, and for the resource and mediating systems diffusion decreased in clarity as the scope of the system increased.

The structure items did have utility for describing internal system characteristics vis-a-vis inter-system linkage. The TEI had frequent linkage which may have been due in part, to well orchestrated roles, teamwork, and specialization. The findings are less clear with the resource system. Perhaps greater structure would have facilitated linkage, but other factors may be more significant, e.g., the scope of the resource system measured by the ratio of resource system personnel to multiunit schools. A slightly clearer picture is presented by the SEA. The ambiguity of a linkage role, the need for and lack of guidelines circumscribing the role, and the marginal nature of a program "tacked on" to the SEA's established activities, may explain the low SEA/user system linkage. For the user system, structure was entwined with diffusion and therefore obfuscated an investigation of a linkage/structure relationship. However, in a number of instances, user system respondents described a degree of confusion over linkage roles with the reosurce and mediating systems. For example, it was not uncommon for a principal to

express concern over the lack of resource system or SEA contact. Since these systems could not realistically have frequent two-way communication with the user system given their National and State wide scope, there appeared to be conflicting expectations among systems for the linkage role. The user system expected greater frequency of linkage vs. the resource system which did not perceive a high linkage frequency as a formal system role expectation. This confusion may be related to the structure of the linkage relationship, i.e., role clarity and agreement for inter-system linkage.

A second example of misperceived expectations occurred between the user system and the TEI. Too frequent linkage was reported by a few principals. This highlights the importance of mutually congruent system roles especially with respect to inter-system relationships. It may be fruitful to investigate linkage, the process for inter-system relationships, in terms of structure.

Linkage appeared to have a direct bearing on the implementation of IGE/MUS. Since new behaviors, roles, and attitudes were required for adopting the innovation, face-to-face training activities appeared to have the greatest impact on the user system. Given the complexity and breadth of the multiunit school, an extensive staff training program is necessary. The frequent linkage between the user system and TEI may be related to the widespread adoption of IGE/MUS. However, schools which did not receive extensive TEI assistance were not studied and therefore conclusions about the effect of extensive TEI linkage should not be made. Nevertheless, from an exploratory perspective, a relationship between linkage and diffusion may exist, i.e., the greater the linkage, then the greater the diffusion of an innovation. Concomitantly, linkage

and structure appeared to be related. The range of linkage activities between the systems provided a basis for explaining system linkage variability. The factor of structure may be related to the extensiveness of inter-system linkage, i.e., the greater the structure between systems, then the greater the linkage. Consequently, there may be a relationship between structure, linkage, and diffusion: high inter-system structure is related to extensive linkage, and extensive linkage is related to successful diffusion.

Conclusions

The concept of structure was considered to have utility for describing inter-system relationships vis-a-vis the diffusion of a product of research. However, by studying structure, a number of issues have emerged. Does structure have a different relationship for different systems, e.g., high resource system structure vs. high mediating system structure? What is the relationship between internal organizational structure and external inter-system structure? It is this last question, structure between systems, that may be meaningful in terms of resource, mediating and user system linkage for effecting the utilization of research developments.

What is being suggested here, is that research developments, in order to travel from their source to their users, entails inter-system relationships. These relationships, to be effective, require varying degrees of structure in terms of coordinated and specialized system roles with explicit expectations. In order to understand, as opposed to making programatic prescriptions, the varying success of planned diffusion and utilization strategies, the consideration of structure may be useful.

From a macro-system perspective, encompassing resource, mediating, and user systems, interdependence between systems appears to be involved

with the diffusion of research developments. Interdependence has been associated with intra-organizational variables (Aiken and Hage, 1968), e.g., complexity (high professionalism and diverse structures), internal communication (number of committees and meetings), and decentralized decision-making (participation in decision-making). A more recent study by Paulson (1974) revealed that only 34 per cent of the variance associated with the dependent variable of interorganizational relationships was explained by intra-organizational factors. He concluded that external system factors should also be included in the study of interorganizational relationships. Paulson's recommendation parallels Havelock's (1971) application of structure as an important factor within systems and between systems for the effective utilization of knowledge.

In order to investigate the influence of intra- and interorganizational structure vis-a-vis the diffusion and eventual adoption of research products, measures must be developed for indexing the multiple effects of structure. For example, studies could extend Aiken and Hage's (1968) measures of intra-organizational structure and apply these measures to external factors between resource, mediating, and user systems. In so doing, the focus of each system should also be considered, i.e., the resource system could be viewed as a creator and developer of knowledge, the mediating system could be viewed as a facilitator and conduit for the diffusion of knowledge, and the user system could be viewed as a receiver and processer of knowledge. These distinct system roles may have different effects on intra-system structure. Concurrently, inter-system structural measures such as extent of system role agreement between the three systems should be developed. A framework for developing intersystem agreement could be borrowed from Lipham and Hoeh's (1974) treatment of role complementarity

Members of each system could indicate self-expectations, and perceived alter's expectations for inter-system relations. Figure 2 illustrates the complementarity of inter-system diffusion roles for the resource and user systems. Comparable schemes would address the relationships between resource and mediating systems, and mediating and user systems.

(Fig. 2 here)

Research has been directed toward intra-organizational characteristics of user systems (Walters, 1973), and toward inter-organizational relationships between resource and user systems (Florio, 1973). In addition, Lingwood & Morris (1974) have identified major dissemination and utilization activities for the resource system and they have related these activities to intra-organizational factors. They found, for example, that organizational support for dissemination and utilization activities was significantly related to actual and ideal knowledge utilization roles.

What has been recommended here is not new. Gummer (1973) concluded that research on interorganizational relationships should include characteristics of the overall network of organizations, and the attributes of individual organizations. However, attention directed toward structural variables, both within and especially between organizations has been minimal. What is being suggested here is that organizational concepts be incorporated into diffusion research. Specifically, it has been suggested that intra-and interorganizational measures of structure be applied to resource, mediating, and user systems in order to explain inter-connectedness between systems and the diffusion and adoption of innovations. A complementarity of roles framework has been suggested for exploring inter-system relationships in terms of structural variables, and concomitantly, inter-system role relationships

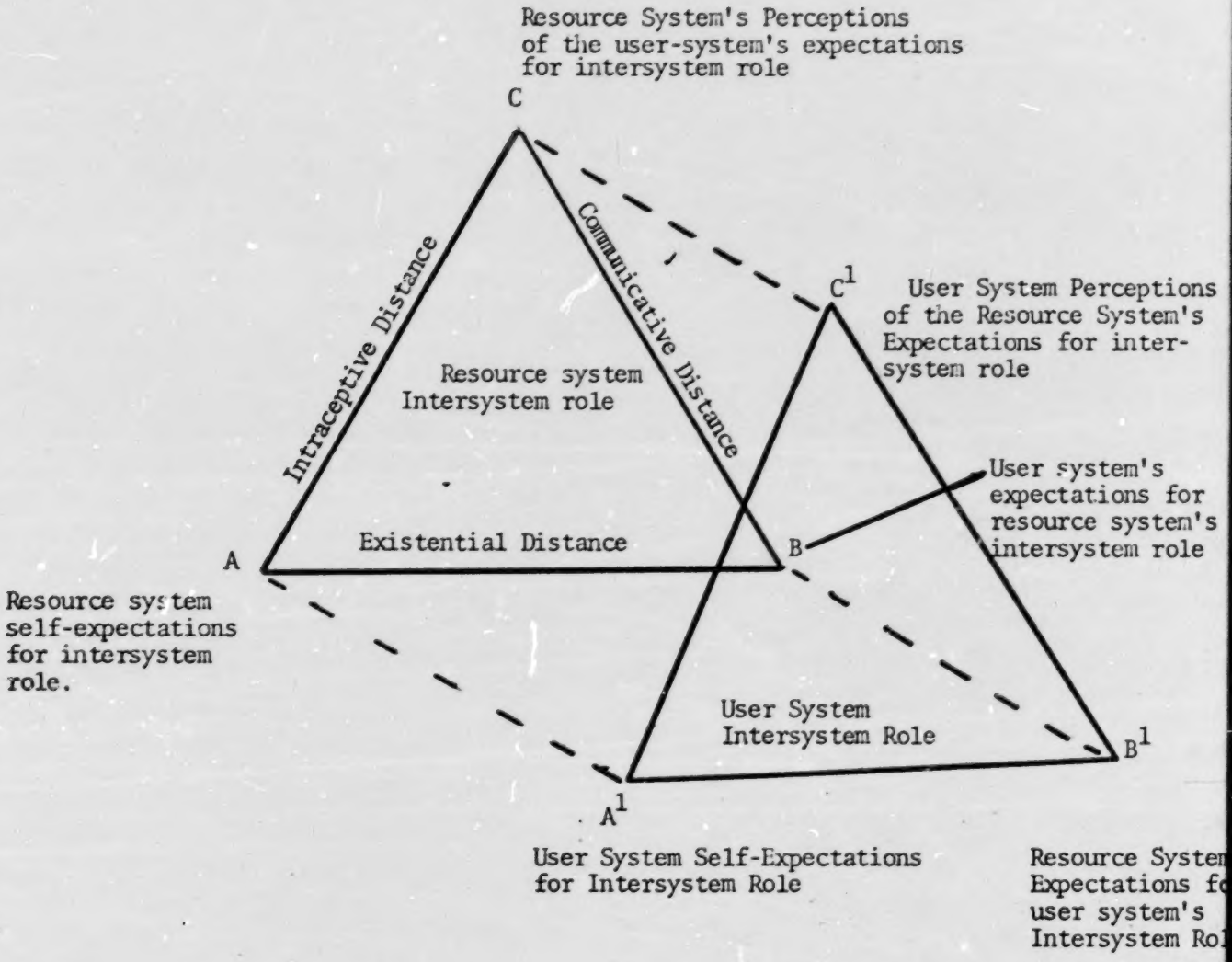

Fig. 2 -- Complementarity of Intersystem Role Expectations and Perceptions Between Resource and User Systems. (Adapted from Lipham and Hoeh, 1974:132)

and structure may be related to intra-system structural characteristics. By relating inter and intra-system characteristics to the utilization of research developments, it may be possible to address some of the inadequacies of the educational change literature documented by Giacquinta (1973: 178): namely, explaining variance between organizations in degree and speed of change.

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TABLE 1

INTERNAL FACTOR OF STRUCTURE
AS REPORTED BY RESOURCE,
MEDIATING AND USER
SYSTEMS

System	STRUCTURE														
	Internal Coordination			Hierarchical Communication			Specialization			Role Clarity			% Mean Response		
	% Response			% Response			% Response			% Response					
	High	Mod.	Low	High	Mod.	Low	High	Mod.	Low	High	Mod.	Low	High	Mod.	Low
Resource (N5)	40	20	40	60	20	20	100					100	50	10	40
Mediating (N10)															
SEA (N3)			100	33	34	33		34	66	33	34	33	16	34	50
TEI (N7)	86		14	72	14	14	100			14	14	72	68	07	25
User (N18)	72	22	06	56	22	22	38	18	44	72	18	10	60	20	20
% Mean Response	64	15	21	58	21	21	58	12	30	45	15	40	56	17	27

TABLE 3

LINKAGE WITH RESOURCE SYSTEM
AS REPORTED BY MEDIATING
AND USER SYSTEMS

	LINKAGE									
	Type			Mode			Mean Annual Frequency per Respondent			
System	Convey	Consult	Train	Face	Tel.	Print	Face	Tel.	Print	Total
Mediating (N10)										
SEA (N3)	X	X		X	X	X	25	21	21	67
TEI (N7)	X	X		X	X	X	24	30	8	62
User (N18)	X		X	X	X	X	1.2	1.7	12	14.9
Total	X	X	X	X	X	X	50.2	52.7	41	143.9

TABLE 4

LINKAGE WITH MEDIATING AND USER SYSTEMS AS REPORTED BY RESOURCE SYSTEM

System	LINKAGE									
	Type			Mode			Mean Annual Frequency Per Respondent			
	Convey	Consult	Train	Face	Tel.	Print	Face	Tel.	Print	Total
Mediating (N10)										
SEA (N3)	X	X	X	X	X	X	7	12	16	35
TEI (N7)	X	X		X	X	X	8	24	16	48
User (N18)	X	X	X	X			.5			.5
Total	X	X	X	X	X	X	15.5	36	32	83.5

TABLE 5

LINKAGE WITH USER SYSTEMS AS REPORTED BY MEDIATING SYSTEM

System	LINKAGE									
	Type			Mode			Mean Annual Frequency Per Respondent			
	Convey	Consult	Train	Face	Tel.	Print	Face	Tel.	Print	Total
Mediating (N10)										
SEA (N3)	X	X	X	X	X	X	41	52	17	110
TEI (N7)	X	X	X	X	X		52	29	0	81
Total	X	X	X	X	X	X	93	31	17	191

TABLE 6

LINKAGE WITH MEDIATING SYSTEM
AS REPORTED BY USER
SYSTEM

System	LINKAGE									
	Type			Mode			Mean Annual Frequency Per Respondent			
	Convey	Consult	Train	Face	Tel.	Print	Face	Tel.	Print	Total
Mediating (N10)										
SEA (N3)	X		X	X		X	1.2		4	5.2
TEI (N7)	X	X	X	X		X	10.5		1.7	12.2
Total	X	X	X	X		X	11.7		5.7	17.4

TABLE 7

LINKAGE BETWEEN MEDIATING SYSTEM AS REPORTED BY SEA AND TEI

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	LINKAGE									
	Type			Mode			Mean Annual Frequency Per Respondent			
System	Convey	Consult	Train	Face	Tel	Print	Face	Tel	Print	Total
Mediating (N10)										
SEA (3)	X	X		X	X	X	46	29	3	78
TEI (N7)	X	X		X	X	X	12	14	3.7	29.7
Total	X	X		X	X	X	58	43	6.7	107.7

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TABLE 8

DIFFUSION OF IGL/IUS-E AS
REPORTED BY RESOURCE,
MEDIATING, AND
USER SYSTEMS

System	DIFFUSION											
	I & R Units			IIC			SPC			% Mean Response		
	% Response			% Response			% Response					
	YES	NO	DON'T KNOW	YES	NO	DON'T KNOW	YES	NO	DON'T KNOW	YES	NO	DON'T KNOW
Resource (N5)	37	0	63	34	0	66	23	11	66	32	03	65
Mediating (N10)												
SEA (N3)	42	0	58	42	0	58	42	29	29	43	10	47
TEI (N7)	88	0	12	93	0	07	65	35	0	79	13	08
User (N18)	94	06	0	100	0	0	88	0	12	94	02	04
% Mean Response	62	12	36	64	0	36	44	20	36	55	07	33